

CLAIMS

I/We claim:

- [c1] 1. A stepper or scanner machine for processing microfeature workpieces, the machine comprising:
 - a housing;
 - an illuminator disposed within the housing;
 - a lens disposed within the housing;
 - a workpiece support disposed within the housing;
 - a cleaning device disposed within the housing to remove contaminants from the workpiece support; and
 - a stage carrying the workpiece support, at least one of the stage and the cleaning device being movable relative to the other to selectively position the workpiece support at least proximate to the cleaning device.
- [c2] 2. The machine of claim 1 wherein the cleaning device comprises an end effector configured to engage the workpiece support to remove contaminants.
- [c3] 3. The machine of claim 1, further comprising a positioning device coupled to the cleaning device to move the cleaning device relative to the housing.
- [c4] 4. The machine of claim 1 wherein the cleaning device is fixed relative to the housing.
- [c5] 5. The machine of claim 1, further comprising a vacuum pump operably coupled to the cleaning device to draw the contaminants from the workpiece support.

[c6] 6. The machine of claim 1, further comprising a cleaning fluid supply; wherein the cleaning device comprises a first passageway in fluid communication with the cleaning fluid supply to provide a cleaning fluid to the workpiece support and a second passageway to exhaust the cleaning fluid from the workpiece support.

[c7] 7. The machine of claim 1 wherein:
the workpiece support comprises a recess to receive a microfeature workpiece; and
the cleaning device comprises a distal portion positionable at least partially in the recess to remove contaminants from the recess.

[c8] 8. The machine of claim 1, further comprising a controller operably coupled to the stage and having a computer-readable medium containing instructions to perform a method comprising positioning the workpiece support under the cleaning device.

[c9] 9. The machine of claim 1, further comprising a controller operably coupled to the cleaning device and having a computer-readable medium containing instructions to perform a method comprising moving the cleaning device relative to the housing.

[c10] 10. The machine of claim 1, further comprising a controller operably coupled to the stage and the cleaning device, the controller having a computer-readable medium containing instructions to perform a method comprising moving the cleaning device and the stage to position the cleaning device at least proximate to the workpiece support.

[c11] 11. A stepper or scanner machine for processing microfeature workpieces, the machine comprising:

a photolithographic exposure system;
a workpiece support having a recess to receive a microfeature workpiece,
the workpiece support being positionable at least proximate to the
photolithographic exposure system;
an internal cleaning device having a distal portion with a passageway for
removing contaminants from the recess of the workpiece support;
and
a stage carrying the workpiece support, at least one of the stage and the
cleaning device being movable relative to the other to position the
distal portion of the cleaning device at least proximate to the recess
of the workpiece support.

[c12] 12. The machine of claim 11, further comprising a housing enclosing the
internal cleaning device, the workpiece support, and the stage.

[c13] 13. The machine of claim 11 wherein the distal portion of the cleaning
device comprises an end effector configured to engage the workpiece support.

[c14] 14. The machine of claim 11, further comprising:
a housing enclosing the workpiece support, the stage, and the internal
cleaning device; and
a positioning device coupled to the cleaning device to move the cleaning
device relative to the housing.

[c15] 15. The machine of claim 11, further comprising a housing enclosing the
workpiece support, the stage, and the internal cleaning device, wherein the
cleaning device is fixed relative to the housing.

[c16] 16. The machine of claim 11, further comprising a vacuum pump operably coupled to the passageway of the cleaning device to draw contaminants from the recess of the workpiece support.

[c17] 17. The machine of claim 11, further comprising a cleaning fluid supply; wherein the passageway comprises a first passageway in fluid communication with the cleaning fluid supply to provide a cleaning fluid to the recess of the workpiece support; and wherein the cleaning device further comprises a second passageway to exhaust the cleaning fluid from the recess of the workpiece support.

[c18] 18. A stepper or scanner machine for processing microfeature workpieces, the machine comprising:
a housing;
a photolithographic system disposed within the housing for patterning a layer of resist on a microfeature workpiece;
a workpiece support within the housing, the workpiece support having a recess to receive the microfeature workpiece;
a means for removing contaminants from the recess of the microfeature workpiece, the means for removing contaminants being disposed within the housing; and
a stage carrying the workpiece support, the stage being movable relative to the means for removing contaminants to selectively position the workpiece support at least proximate to the means for removing contaminants.

[c19] 19. The machine of claim 18 wherein the means for removing contaminants comprises an end effector configured to engage the workpiece support to remove contaminants.

[c20] 20. The machine of claim 18 wherein:
the means for removing contaminants comprises a distal portion with a
passageway; and
the machine further comprises a vacuum pump operably coupled to the
passageway to draw contaminants from the workpiece support.

[c21] 21. The machine of claim 18, further comprising a cleaning fluid supply;
wherein the means for removing contaminants comprises a first
passageway in fluid communication with the cleaning fluid supply to
provide a cleaning fluid to the workpiece support and a second
passageway to exhaust the cleaning fluid from the workpiece
support.

[c22] 22. A method of cleaning a stepper or scanner machine, the method
comprising:
positioning a cleaning device at least proximate to a workpiece support
without removing a portion of a housing of the machine, the
workpiece support and the cleaning device being disposed within
the housing; and
removing contaminants from the workpiece support with the cleaning
device.

[c23] 23. The method of claim 22 wherein positioning the cleaning device
proximate to the workpiece support comprises moving the cleaning device relative
to the housing of the machine.

[c24] 24. The method of claim 22 wherein positioning the cleaning device
proximate to the workpiece support comprises moving a stage carrying the
workpiece support.

[c25] 25. The method of claim 22 wherein positioning the cleaning device comprises positioning a distal portion of the cleaning device at least partially in a recess in the workpiece support, the recess configured to receive a microfeature workpiece.

[c26] 26. The method of claim 22 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the workpiece support comprises engaging the workpiece support with the end effector.

[c27] 27. The method of claim 22 wherein removing contaminants from the workpiece support comprises drawing contaminants from the workpiece support through a passageway in the cleaning device with a vacuum pump.

[c28] 28. The method of claim 22, further comprising providing a cleaning fluid to the workpiece support through a first passageway in the cleaning device; wherein removing contaminants from the workpiece support comprises exhausting the cleaning fluid from the workpiece support through a second passageway in the cleaning device.

[c29] 29. The method of claim 22, further comprising determining the workpiece support contains contaminants before the procedures of positioning the cleaning device and removing contaminants.

[c30] 30. The method of claim 22 wherein the procedures of positioning the cleaning device and removing contaminants are repeated at periodic intervals.

[c31] 31. A method of cleaning a stepper or scanner machine, the stepper or scanner machine including a housing, a cleaning device within the housing, and a workpiece support within the housing, the method comprising:

moving at least one of the cleaning device and the workpiece support so that a distal portion of the cleaning device is positioned at least proximate to a recess in the workpiece support; and
removing contaminants from the recess in the workpiece support via a passageway in the cleaning device.

[c32] 32. The method of claim 31 wherein moving at least one of the cleaning device and the workpiece support comprises moving the cleaning device relative to the housing.

[c33] 33. The method of claim 31 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the recess comprises engaging the workpiece support with the end effector.

[c34] 34. The method of claim 31 wherein removing contaminants from the recess comprises drawing contaminants from the recess through the passageway in the cleaning device with a vacuum pump.

[c35] 35. The method of claim 31, further comprising providing a cleaning fluid to the recess;
wherein removing contaminants from the recess comprises exhausting the cleaning fluid from the recess through the passageway in the cleaning device.

[c36] 36. The method of claim 31, further comprising determining the workpiece support contains contaminants before the procedures of moving the cleaning device and removing contaminants.

[c37] 37. The method of claim 31 wherein the procedures of moving the cleaning device and removing contaminants are repeated at periodic intervals.

[c38] 38. The method of claim 31 wherein moving the cleaning device comprises positioning the cleaning device at least proximate to the workpiece support without removing a portion of the housing.

[c39] 39. A method of cleaning a stepper or scanner machine, the method comprising:

within a housing of the stepper or scanner machine, automatically positioning a workpiece support proximate to a cleaning device; and removing contaminants from the workpiece support with the cleaning device.

[c40] 40. The method of claim 39 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the workpiece support comprises engaging the workpiece support with the end effector.

[c41] 41. The method of claim 39 wherein removing contaminants from the workpiece support comprises drawing contaminants from the workpiece support through a passageway in the cleaning device with a vacuum pump.

[c42] 42. The method of claim 39, further comprising providing a cleaning fluid to the workpiece support through a first passageway in the cleaning device; wherein removing contaminants from the workpiece support comprises exhausting the cleaning fluid from the workpiece support through a second passageway in the cleaning device.

[c43] 43. The method of claim 39 wherein the procedures of automatically positioning the workpiece support and removing contaminants are repeated at periodic intervals.

[c44] 44. A method of patterning microfeature workpieces with a stepper or scanner machine, the method comprising:

patterning a first microfeature workpiece by exposing the first workpiece to a source of radiation;

positioning a cleaning device at least proximate to a workpiece support without removing a portion of a housing of the machine, the workpiece support and the cleaning device being disposed within the housing;

removing contaminants from the workpiece support with the cleaning device; and

patterning a second microfeature workpiece by exposing the second workpiece to the source of radiation.

[c45] 45. The method of claim 44 wherein removing contaminants from the workpiece support comprises drawing contaminants from the workpiece support through a passageway in the cleaning device with a vacuum pump.

[c46] 46. The method of claim 44 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the workpiece support comprises engaging the workpiece support with the end effector.

[c47] 47. A method of patterning microfeature workpieces with a stepper or scanner machine, the stepper or scanner machine including a housing, a cleaning device within the housing, a radiation source within the housing, and a workpiece support within the housing, the method comprising:

patterning a first microfeature workpiece by exposing the first workpiece to the radiation source;

moving at least one of the cleaning device and the workpiece support so that a distal portion of the cleaning device is positioned at least proximate to a recess in the workpiece support;

removing contaminants from the recess in the workpiece support via a passageway in the cleaning device; and patterning a second microfeature workpiece by exposing the second workpiece to the radiation source.

[c48] 48. The method of claim 47 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the recess comprises engaging the workpiece support with the end effector.

[c49] 49. The method of claim 47 wherein removing contaminants from the recess comprises drawing contaminants from the recess through the passageway in the cleaning device with a vacuum pump.

[c50] 50. A method of patterning microfeature workpieces with a stepper or scanner machine, the method comprising:

patternning a first microfeature workpiece by exposing the first workpiece to a source of radiation;
within a housing of the stepper or scanner machine, automatically positioning a workpiece support proximate to a cleaning device;
removing contaminants from the workpiece support with the cleaning device; and
patternning a second microfeature workpiece by exposing the second workpiece to the source of radiation.

[c51] 51. The method of claim 50 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the workpiece support comprises engaging the workpiece support with the end effector.

[c52] 52. The method of claim 50 wherein removing contaminants from the workpiece support comprises drawing contaminants from the workpiece support through a passageway in the cleaning device with a vacuum pump.

[c53] 53. A method of monitoring a stepper or scanner machine, the stepper or scanner machine including a housing, a cleaning device within the housing, and a workpiece support within the housing, the method comprising:
patterning a microfeature workpiece;
determining if the microfeature workpiece contains a focus spot after patterning the microfeature workpiece;
if the microfeature workpiece contains the focus spot, moving at least one of the cleaning device and the workpiece support so that a distal portion of the cleaning device is positioned at least proximate to a region of the workpiece support corresponding to the location of the focus spot on the microfeature workpiece; and
if the microfeature workpiece contains the focus spot, removing contaminants from the workpiece support via a passageway in the cleaning device.

[c54] 54. The method of claim 53 wherein removing contaminants from the workpiece support comprises drawing contaminants from the workpiece support through the passageway in the cleaning device with a vacuum pump.

[c55] 55. The method of claim 53 wherein the cleaning device comprises an end effector, and wherein removing contaminants from the workpiece support comprises engaging the workpiece support with the end effector.